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(12) PATENT SPECIFICATION

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(54) BUILDING COMPOSITION AND PULVERULENT AGGREGATE FOR  
THE BUILDING COMPOSITION - LIGNOPAN

(57) Abstract:

The invention relates to the building industry and can be used in the preparation of building compositions, primarily of concrete or mortar mixtures in the production of concrete and reinforced concrete products and structures for precast and monolithic construction, and also in the petroleum and gas industry in bore construction, operation and maintenance. In the building composition, which consists of mineral binder, filler, water and pulverulent aggregate containing Lignopan B1, this aggregate additionally comprises the fixing salt and/or aluminum sulfate in the following ratio of its components in mass%: Lignopan B1 89-95, fixing salt and/or aluminum sulfate 5-11 and the ratio of components of the building composition in kg/m<sup>3</sup>: mineral binder 250-600, filler 1050-1900, water 120-300, where the content of the aggregate mentioned is 0.25 to 0.45 mass% of the mass of the mineral binder. The building composition can comprise, as mineral binder, Portland cement or slag Portland cement, lime silicate or gypsum cement puzzolan binder and, as filler, quartz sand with a size modulus of from 2.0 to 3.0; stone gravel of fraction 5-40 mm or 5-200 mm and quartz sand with a size modulus of from 2.0 to 3.0 in the ratio 1.4 : 2.0. The pulverulent aggregate comprising the Lignopan B1 for the building composition additionally comprises the fixing salt and/or aluminum sulfate in the following ratio of the components in mass%: Lignopan B1 89-95, fixing salt and/or aluminum sulfate 5-11. The technical result is the increase in the water imperviousness of the building composition for a reduced consumption of cement, and also the prevention of laitance on the products and structures made from said building

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composition.

7 patent claims and 2 tables

The invention relates to the building industry and can be used in the preparation of building compositions, primarily of concrete or mortar mixtures in the production of concrete and reinforced concrete products  
5 and structures for precast and monolithic construction, and also in the petroleum and gas industry in bore construction, operation and maintenance.

The building composition which comprises the following  
10 components (in kg/m<sup>3</sup>) is known: Portland cement 450, granite gravel 984, sand 737, water 202 liters and complex aggregate 0.5-0.9% of the mass of the cement. The aggregate is obtained by drying the mixture which comprises aqueous solution of technical-grade  
15 lignosulfonates, sodium sulfate, alkaline modifier - alkali-containing mineral reagent and 50% strength solution of the fatty acid production residues in petroleum spirit in the ratio 1:(0.6-1.5):(0.05:0.15):(0.05-0.1) [1].

20 The building composition which consists of the following components (in kg/m<sup>3</sup>) is known: Portland cement 430, sand 820, stone gravel 960, water 180 liters and complex aggregate which comprises the  
25 mixture, dried at 200-300°C, of aqueous solution of technical-grade lignosulfonates and the spent sulfur cleaning solution from gas coking plants based on the fixing salt in the ratio (1-3):(5-10):(0.05:0.15):(0.05-0.1), converted to dry substance  
30 [2].

The nearest analog for the building composition is the building composition which comprises the mineral binder, the filler, the water and the pulverulent  
35 aggregate Lignopan B1 in the ratio of the building composition components (in kg/m<sup>3</sup>): mineral binder 300-500, filler 1250-1790, water 180-210 and aggregate 0.2-0.7 mass% of the mass of the mineral binder [3].

The closest analog for the aggregate which is the subject of the application is the pulverulent aggregate for the building composition Lignopan B1 - the fraction dried at 78-82°C in pseudoliquid layer and having the 5 molecular weight  $10 \cdot 10^3$  to  $20 \cdot 10^3$ , obtained from the mixture which comprises aqueous solution of technical-grade lignosulfonates 95-97 mass% and alkaline protease (with pH 9 to 12) 5-3 mass% [3].

10 The object of the invention is to increase the water imperviousness of the building composition for a reduced cement consumption, and to avoid the laitance on the products and structures made from said building composition.

15 This object is achieved in that in the building composition which consists of mineral binder, filler, water and pulverulent aggregate containing the Lignopan B1, said aggregate additionally comprises the fixing 20 salt and/or aluminum sulfate in the following ratio of its components in mass%: Lignopan B1 - 89-85, fixing salt and/or aluminum sulfate 5-11, with the ratio of the components of the building composition in kg/m<sup>3</sup>:

|    |                |           |
|----|----------------|-----------|
| 25 | mineral binder | 250-600   |
|    | filler         | 1050-1900 |
|    | water          | 120-300,  |

30 where the content of said aggregate is 0.25-0.45 mass% of the mass of the mineral binder.

As mineral binder, the building composition can comprise Portland cement or slag Portland cement, lime silicate or gypsum cement puzzolan binder.

35 As filler, the building composition can comprise quartz sand with the size modulus 2.0-3.0 or stone gravel of fraction 5-40 mm or 5-20 mm and quartz sand with the

size modulus 2.0-3.0 in the ratio 1.4:2.0.

The set object is also achieved by the pulverulent aggregate for the building composition containing the  
5 Lignopan B1 additionally comprising the fixing salt and/or aluminum sulfate in the following ratio of components in mass%:

|                                     |       |
|-------------------------------------|-------|
| Lignopan B1                         | 89-95 |
| fixing salt and/or aluminum sulfate | 5-11. |

10

The invention is realized in the following way.

The aggregate which is the subject of the application is prepared.

15 To prepare the aggregate Lignopan B1, an aqueous solution of technical-grade lignosulfonate (LST) of 50% strength concentration and the enzyme preparation - alkaline protease with pH 9-12 - is used. Technical-grade lignosulfonates are mixed with alkaline  
20 protease with pH 9-12 with subsequent isolation from the resulting mixture with the help of polymer membranes of the fraction with the molecular weight  $10 \cdot 10^3$ - $20 \cdot 10^3$ , and they are dried in a pseudoliquid layer at 78-82°C. In this connection, it is advisable  
25 to store the mixture prior to the fractionation for 4 hours at 40-50°C. The Lignopan B1 and the fixing salt and/or aluminum sulfate are then mixed in mass%:  
Lignopan B1 89-95, fixing salt and/or aluminum sulfate 5-11.

30

To prepare the building composition - the concrete and mortar mixture - a mineral binder, e.g. Portland cement, the stone gravel of fraction 5-40 or 5-20 mm, the sand with the size modulus 2.0, the water and said  
35 aggregate are used in the amount 0.22-0.45 mass% of the amount of the mineral binder. The compositions of the aggregate, of the concrete and mortar mixtures and physicomechanical properties are given in tables 1 and

2.

TABLE 1

| Composition<br>Run<br>No. | Building composition components<br>(consumption, kg/m <sup>3</sup> ) |        |       |       |   | Aggregate components, mass% |                |                     |
|---------------------------|--|--------|-------|-------|---|-----------------------------|----------------|---------------------|
|                           | Mineral<br>binder  | Filler |       | Water | Aggregate<br>% of the<br>binder<br>mass | Lignopan<br>B1              | Fixing<br>salt | Aluminum<br>sulfate |
|                           |  | Gravel | Sand  |       |   |                             |                |                     |
| 1                         | 250  | 432.4  | 617.6 | 120   | 0.25                                    | 90                          | 7              | 3                   |
| 2                         | 300  | 616.6  | 882.4 | 150   | 0.3                                     | 92                          | 8              |                     |
| 3                         | 500  | -      | 1500  | 200   | 0.25                                    | 89                          |                | 11                  |
| 4                         | 600  | 617    | 882.4 | 300   | 0.45                                    | 95                          | 5              |                     |
| 5                         | 250  | 782.4  | 117.6 | 120   | 0.3                                     | 88                          | 10             | 2                   |

5

In compositions 1, 3, Portland cement of the brand 500 is used as binder.

In compositions 2, 4, slag Portland cement of the brand 400 is used as binder.

10 In composition 5, lime silicate binder is used as binder.

In compositions 1, 2, gravel of fraction 5-20 mm and sand with size modulus 2 are used.

15 In compositions 4, 5, gravel of fraction 5-40 mm and sand with size modulus 3 are used.

In composition 3, sand with size modulus 2 is used.

| Properties | Compressive strength in MPa<br>upon normal hardening |              | Water<br>imperviousness W | Laitance    |
|------------|--|--------------|---------------------------|-------------|
|            | Run No.  | After 3 days | After 5 days              |             |
| 1          |  | 9.15         | 13.5                      | 3           |
| 2          |  | 16.2         | 25.1                      | 5           |
| 3          |  | 25.5         | 33.5                      | 7           |
| 4          |  | 33.2         | 44.5                      | 12          |
| 5          |  | 9.0          | 13                        | 3           |
|            |  |              |                           | not present |

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Claims

1. A building composition which consists of mineral binder, filler, water and pulverulent aggregate containing Lignopan B1, wherein said aggregate additionally comprises the fixing salt and/or aluminum sulfate in the following ratio of its components in mass%: Lignopan B1 - 89-95, fixing salt and/or aluminum sulfate 5-11 with a ratio of the components of the building composition in kg/m<sup>3</sup>:

|    |                |           |
|----|----------------|-----------|
|    | mineral binder | 250-600   |
|    | filler         | 1050-1900 |
| 15 | water          | 120-300,  |

where the content of said aggregate is 0.25-0.45 mass% of the mass of the mineral binder.

20 2. The composition as claimed in claim 1, which comprises the Portland cement or slag Portland cement as mineral binder.

25 3. The composition as claimed in claim 1, which comprises the lime silicate binder as mineral binder.

30 4. The composition as claimed in claim 1, which comprises the gypsum cement puzzolan binder as mineral binder.

35 5. The composition as claimed in claim 1, which comprises the quartz sand with the size modulus of 2.0-3.0 as filler.

6. The composition as claimed in claim 1, which comprises the stone gravel of fraction 5-40 mm or 5-20 mm and the quartz sand with the size modulus

of 2.0-3.0 in the ratio 1.4:2.0 as filler.

7. A pulverulent aggregate containing Lignopan B1 for  
the building composition as claimed in claim 1,  
5 wherein it additionally comprises the fixing salt  
and/or aluminum sulfate in the following ratio of  
their components in mass%:

|    |                                     |       |
|----|-------------------------------------|-------|
| 10 | Lignopan B1                         | 89-95 |
|    | fixing salt and/or aluminum sulfate | 5-11. |